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Assessment of cultivars of China aster (*Callistephus chinensis* L.) Nees) in Kerala's Northern laterite region

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Abstract

The trial was conducted at ARS Anakkayam, Kerala Agricultural University, to assess the performance of seven cultivars of China aster under Northern laterites region of Kerala. The outcomes presented high dissimilarity in the performance of all seven cultivars for growth and flowering characteristics. Maximum plant height (69.93 cm) in addition to the highest number of leaves per plant was noted in Arka Shashank while Arka Archana recorded the highest width of disc florets, leaf length as well as maximum yield per plant. On the other hand, Arka Archana and Arka Aadya were early to flower (76 days). Arka Aadya recorded the highest number of primary branches as well as the highest vase life (24.47 days). The minimum value for the number of primary branches, number of flowers per plant, and flower diameter of disc florets was observed in Arka Poornima while the same variety recorded the highest flower diameter of ray florets as well as days required for first flowering. Individual flower weight (1.46 g) was recorded highest by Arka Shubhi (1.46 grams) followed by Arka Poornima (1.45 g).

Keywords: China aster, evaluation, performance, cultivars, varieties

Introduction

Callistephus chinensis (L.) Nees, often known as China aster, is a monotypic genus of flowering plants in the Asteraceae family and is grown as an ornamental plant all over the world. It is home to the only species *Callistephus chinensis*. China aster comes in third place for popularity among annuals, following marigold and chrysanthemum [1]. This is a monocotyledonous, generally unbranched plant that can grow to be 20–100 cm tall either annually or biennially. The large, solitary flower head occasionally blooms on branches and at the summit of the stem. One or two bands of ray florets, typically in reddish purple, can be seen on the head [2]. There are many different flower colors, heights, and single or double heads among the cultivars. There are several types with a wide range of floral colors. Different colored flower cultivars were produced by hybridization. Ray florets on cultivated types can be practically any color, including pink, purple, blue, red, or white.

This plant is an adapted species that grows on the edges of deciduous woods in a number of places outside of its natural range, including Europe, Indochina, New Zealand, North America and Australia. It grows between 300 and 2700 meters above mean sea level. It grows well as an ornamental plant in new, humus-rich, nutrient-rich soils with warm, humid air [3]. While cultivars like Arka Shashank, Arka Kamini, Arka Poornima, and Violet Cushion have been grown in Kerala on a sparse basis for a variety of uses, there was a dearth of knowledge regarding the best China aster cultivar for producing cut flowers and loose flowers in the northern laterite conditions of the Anakkayam area. Therefore, the goal of the current study was to determine which China aster cultivars are best for producing high-quality cut flowers and loose flowers. This is because it is important to select cultivars that will maximize the benefits of the commercial cultivars currently in use.

Materials and Methods

Seven genotypes of China aster were included in the experiment, which was set up using three replications in a randomized block design. Arka Shashank, Arka Neerali, Arka Archana, Arka Aadya, Arka Poornima, Arka Kamini, and Arka Shubhi were used as planting

material for the study. Each replication had ten plants planted at a 30 x 25 cm spacing. In a polyhouse, the study was conducted in a protected environment. Records included number of primary branches per plant, plant height (cm), stalk length (cm), number of flowers per plant, weight of flowers per plant (g), number of individual flowers, number of days until first flower opening, flower head diameter (cm), flowering duration (days), and vase life (days). The SPSS statistical software's specified approach was used to carry out the analysis of variance.

Results and Discussion

Cultivar performance for growth characteristics

Table 1 shows the average performance of seven China aster cultivars in terms of various growth characteristics. The statistics show that the China aster cultivar Arka Shashank had the highest plant height (69.93 cm), followed by Arka Neerali. On the contrary, the shortest plant height was obtained in cultivar Arka Aadya (26.87 cm), whereas Arka Kamini measured 41 cm, which is consistent with the findings of Teerath Rai and SVS Chaudhary [4]. Plant height

varied significantly across varieties. As a varietal property, differences across cultivars are related to the plant's genetic makeup [4]. Variations in plant height related to variations and genotypes have also been found in China aster [5] and gladiolus [6,7].

Arka Aadya had the most primary branches (3.17), which was statistically comparable to Arka Neerali (3.00), while Arka Poornima had the least (1.83). The number of major branches, like other traits, is a varietal attribute that is expressed differently depending on the plant's genotype [8,9]. Arka Neerali had the longest stalk (21.39 cm), which was comparable to Arka Shubhi's (20.66 cm). In contrast, Arka Shashank had the shortest stalk length (15.15 cm). It was found to be statistically equivalent to 'Arka Archana' (15.79). The plant's genetic makeup is responsible for the variations between cultivars. Kishanswaroop *et al.*, and Zosiamliana *et al.*, reported a significant difference in stalk length [10,11]. Maynard and David (1987) suggested that this variation might arise from the presence of an environment that is conducive to the dominant gene's expression in genotypes [12].

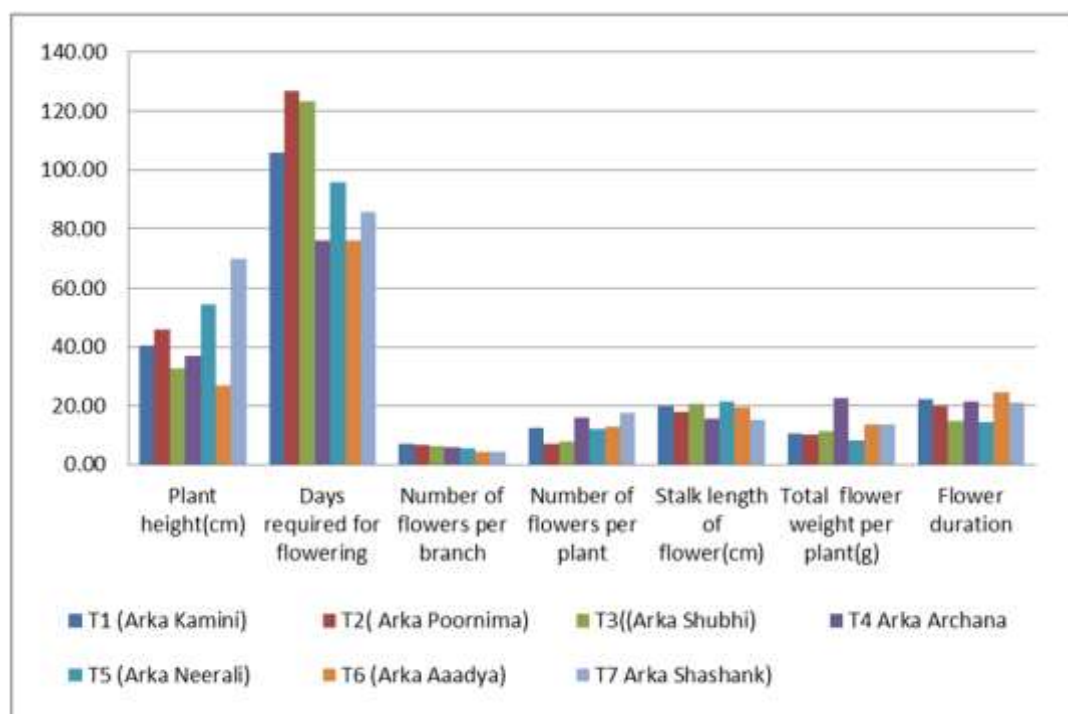


Fig 1: Performance of China aster in the northern laterites of Kerala.

Cultivar performance for flowering characteristics

The seven genotypes tested throughout the trial exhibited substantial variance in flowering characteristics. Arka Archana had the shortest time to first flower opening (76.13 days), which was statistically comparable to 'Arka Aadhya' (75.87 days), while Arka Poornima took the longest (126.67 days). According to the findings of Teerath Rai and SVS Chaudhary (2016), Arka Poornima took 104.75 days to open its first blossom. Whether an early or late flowering cultivar can be determined by counting the days it takes for the first flower to appear. These methods help anticipate flower availability over an extended length of time [13]. However, early blossoming is preferable because it minimizes flowering duration and enhances profit [14]. Though the number of days it takes for the first bloom to open is a varietal trait, Dhiman (2003) proposed that higher dry matter buildup during favorable meteorological

circumstances could be the cause of earliness in this trait [15]. Khangarakpam *et al.* (2014) and Kumar and Patil (2003) have also documented variations in the number of days to initial flower opening [16,17].

The longer the flowering period, the greater the non-synchronous maturity among the flowers, which means that fewer flowers will reach the harvesting stage simultaneously. Even though there are many kinds of cultivation, each one performs differently depending on the environment [4]. Furthermore, nutritional and environmental variables during the growing phase influence flowering characteristics [18]. The largest flower head diameter of disc florets was seen in Arka Archana, whereas that of ray florets was recorded by Arka Poornima (3.07 cm). Both genetic and environmental variables may be responsible for the observed variation in flower head diameter between cultivars [4].

The maximum vase life was seen in 'Arka Aadhya' (24.47 days), which was statistically equivalent to 'Arka Kamini' (22.27 days), while the least flowering time was reported in Arka Neerali (14.47 days), which was statistically equivalent to 'Arka Shubhi'. Flowering time is useful in determining the availability of flowers over a longer period. The observed variations can be traced to the plant's genotype. Khangarakam *et al.* (2014) and Pandey and Rao (2014) found variations in flowering length in Chinese asters [17, 19]. Raghuvanshi (2007) and Singh *et al.* (2014) on African marigold [14, 20].

Cultivar performance for yield characteristics

Substantial differences in yield parameters were noticed amongst the China aster cultivars. 'Arka Shashank' produced the most flowers per plant (17.53). In contrast, Arka Poornima produced the fewest number of flowers per plant (6.93). The number of blooms per plant is an essential element in determining plant production. Such differences between cultivars can be traced to genetic reasons. Chavan *et al.* (2010) and Poornima *et al.* (2006) found similar results for the number of flowers per plant in China aster [5, 8], as did Sharma (2014) in French marigold [21].

The highest weight of flowers per plant was obtained in 'Arka Archana' (Fig 1), followed by 'Arka Aadya' and 'Arka Shashank', which were statistically comparable. Arka Poornima, on the other hand, recorded the lowest bloom weight per plant. The weight of flowers per plant is the most significant factor to consider in commercial growing.

Although it is determined by the plant's genetic makeup, several additional elements, such as individual flower weight and the number of flowers per plant, play an important effect [4]. The data of Zosiambiana *et al.* (2013) and Tirakannanavar *et al.* (2015) support the diversity across cultivars in terms of flower weight per plant [11, 22].

The highest individual flower weight was found in Arka Shubhi (1.46 g), which was statistically comparable to Arka Poornima. The minimum individual blossom weight was observed in 'Arka neerali'. Variations in flowering qualities could be attributable to the cultivars' genetic makeup. Kishanswaroop *et al.* (2004) and Kumar and Patil (2003) found a large range of individual flower weights in China aster [16, 10], as did Sharma (2014) in African marigold [21].

Cultivar performance for storability

The longest shelf life was reported in 'Arka Aadhya' (24.47 days), followed by Arka Kamini. 'Arka Neerali' had the shortest shelf life at 14.47 days. Although all cultivars were tested at the same temperature and relative humidity, variations in these characteristics may be related to genetic makeup. Pandey and Rao (2014) and Kishanswaroop *et al.* (2004) and found similar results in Chinese aster [19, 10], as did Raghuvanshi (2007) in French marigold [20]. Arka Archana recorded the highest weight of flowers per plant, while Arka Shubhi measured the weight of each bloom. As a result, Arka Shubhi is superior to other cultivars in terms of loose flower yield. Arka Aadya was identified as the best cultivar for cut flower production, with the longest vase life.

Table 1: Mean performance of cultivars for growth and flowering and yield characters

TREATMENTS	Plant height (cm)	Number of leaves	Length of leaf(cm)	Leaf width (cm)	Leaf Area (Sq cm)	Number of branches	Branch diameter(cm)	Days required for flowering	Number of flowers per branch	Number of flowers per plant	Flower diameter of Disc florets (cm)	Flower diameter of Ray florets (cm)	Stalk length of flower (cm)	Individual flower weight (grams)	Total flower weight per plant (g)	Vase life (days)
T ₁ (Arka Kamini)	40.5 ^d	27.7 ^b	4.4 ^b	3.7 ^{ab}	19.7 ^a	2.4 ^{bc}	0.5 ^d	105.9 ^b	7.1 ^a	12.3 ^{ab}	0.9 ^b	2.6 ^{bc}	19.9	0.8 ^{bc}	10.4 ^b	22.3 ^{ab}
T ₂ (Arka Poornima)	45.9 ^e	34.9 ^a	4.0 ^b	3.2 ^c	14.0 ^{cd}	1.8 ^c	0.5 ^e	126.1 ^a	6.7 ^{ab}	6.9 ^b	0.0 ^e	3.1 ^a	17.8	1.4 ^a	10.1 ^b	19.9 ^e
T ₃ (Arka Shubhi)	32.7 ^e	24.8 ^b	2.7 ^c	2.0 ^d	10.6 ^d	2.0 ^e	0.4 ^e	123.3 ^a	6.4 ^{ab}	7.7 ^b	0.9 ^b	2.4 ^{cd}	20.7	1.5 ^a	11.4 ^b	14.9 ^d
T ₄ Arka Archana	36.9 ^{de}	28.5 ^b	5.9 ^a	4.2 ^a	15.4 ^{abc}	2.2 ^c	0.7 ^a	75.9 ^e	6.0 ^{ab}	16.0 ^a	1.4 ^c	2.5 ^{bc}	15.8	1.4 ^a	22.5 ^a	21.3 ^{bc}
T ₅ (Arka Neerali)	54.4 ^b	25.7 ^b	4.7 ^b	3.7 ^{ab}	16.9 ^{ab}	3.0 ^{ab}	0.3 ^f	95.7 ^e	5.5 ^{bc}	12.3 ^{ab}	0.0 ^e	2.0 ^d	21.4	0.6 ^e	8.2 ^b	14.5 ^d
T ₆ (Arka Aadya)	26.9 ^e	23.7 ^b	4.7 ^b	3.3 ^{bc}	12.9 ^d	3.2 ^a	0.6 ^{bc}	76.1 ^e	4.6 ^c	13.0 ^{ab}	1.0 ^b	2.8 ^{ab}	19.6	1.1 ^{ab}	13.6 ^b	24.5 ^a
T ₇ Arka Shashank	69.9 ^a	39.1 ^a	5.7 ^a	3.7 ^{bc}	12.1 ^{cd}	2.3 ^c	0.6 ^b	85.8 ^d	4.3 ^c	17.5 ^a	0.0 ^c	2.7 ^{abc}	15.2	0.8 ^{bc}	13.7 ^b	21.0 ^e
SEM	40.5	27.7	4.4	3.7	19.7	2.4	0.5	105.9	7.1	12.3	0.9	2.6	19.9	0.8	10.4	22.3

T₁-Arka Kamini, T₂-Arka Poornima, T₃-Arka Shubhi, T₄-Arka Archana, T₅-Arka Neerali, T₆-Arka Aadya, T₇-Arka Shashank

Conclusion

Based on the experimental result it is observed that Arka Archana performed well with the highest flower yield and the highest vase life was observed in Arka Aadya. Hence Arka Archana and Arka Aadya can be recommended for cultivation in the northern laterite regions of Kerala. Arka Archana can be recommended for both loose flower and cut

flower purpose. Whereas Arka Aadya can be recommended for cut flower purpose.

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